Progress in Heart, Lung, and Blood Research

Brighter Prospects for Premature Babies

In August 1963, the younger son of President and Mrs. Kennedy died of respiratory distress syndrome (RDS). Patrick Bouvier Kennedy, who was born 5½ weeks prematurely and weighed only 4 pounds, 10½ ounces, lived for less than two days. Because his lungs were not fully developed, breathing was for him a hopeless struggle.

Unfortunately, the loss experienced by the Kennedys was shared by many other families at that time. About 25,000 American babies, most of them premature, developed RDS each year and 10,000 of them died.

Thanks to a substantial investment in basic and clinical research by the National Institutes of Health (NIH), today's numbers tell a different story. Even though the number of premature births in the United States has increased substantially since the 1960s, RDS now claims the lives of only about 700 babies annually. Virtually all newborns of Patrick's gestational age and birth weight who develop RDS recover from it, and many born much earlier and smaller have a remarkably good chance of surviving.

This success story, like many others in medicine, did not follow a straight path. Research was sidetracked for decades by autopsy findings of a glass-like membrane in the lungs of babies who died of RDS. This mysterious material was believed to be the cause of the breathing difficulty, and for many years, RDS was called hyaline membrane disease after the Greek word for glass.

A breakthrough came in 1959 when NIH-funded researchers in Boston discovered that a foamy liquid called surfactant was missing from the lungs of infants who died of RDS. Pulmonary surfactant stabilizes the tiny air sacs in the lungs, the alveoli, and keeps them from collapsing between breaths. At the culmination of a normal full-term pregnancy, a burst of surfactant production prepares the soon-to-be-born baby to breathe air.

This discovery paved the way for two additional critical advances. Study of the chemical signals involved in the birth of lambs revealed that steroid hormones not only trigger labor but also signal the lungs to produce surfactant. Subsequent clinical trials in women about to deliver prematurely showed that delaying labor for a day or more while administering a steroid drug could prevent RDS. Meanwhile, other researchers developed prenatal tests to gauge whether a fetus had enough surfactant to breathe properly, thus making it possible to identify newborns likely to need special care.

Both developments coincided with tremendous innovations in the care of premature newborns. The establishment of a national network of advanced neonatal intensive care nurseries and widespread access to them via a system of regionalization made state-of-the-art support available to high-risk infants. Use of a ventilatory assistance technique that applied a constant slight pressure to keep the alveoli from collapsing while a baby breathed on its own dramatically reduced mortality among those babies who had developed RDS.

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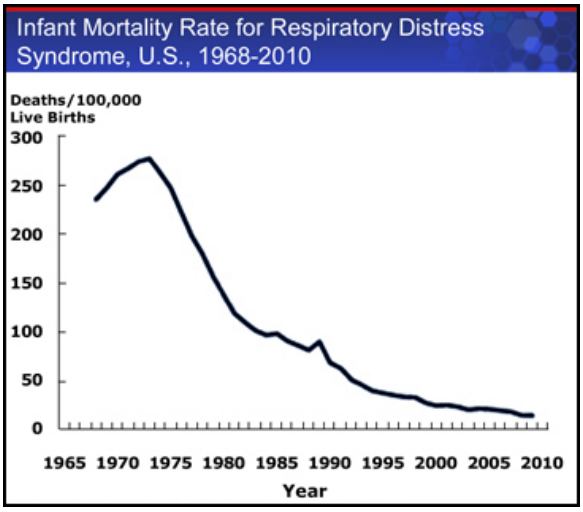
Meanwhile, several groups of researchers had been exploring the composition, metabolism, and source of pulmonary surfactant. The knowledge emerging from these studies led ultimately to NIH-supported clinical trials that established the efficacy of surfactant replacement therapy for neonatal RDS. By the early 1990s, two surfactant preparations—one derived from cows' lungs and one synthesized—had been approved by the FDA.

Since the initial clinical trials of surfactant replacement, dozens of further studies supported by the NIH and the pharmaceutical industry have validated and refined this vital treatment. The American Academy of Pediatrics issued guidelines for the use of surfactants in 1998, and produced an updated version in 2008.

Today, parents of premature infants can themselves breathe easier because NIH-supported research has been translated into practice across the country and greatly improved the odds that their babies will survive and thrive.



Source: Vital Statistics of the United States, CDC/National Center for Health Statistics

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